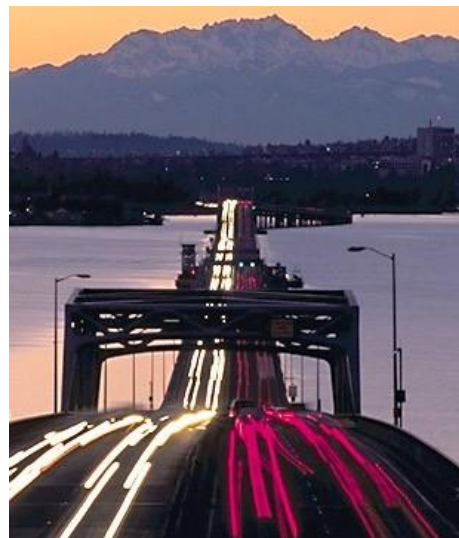


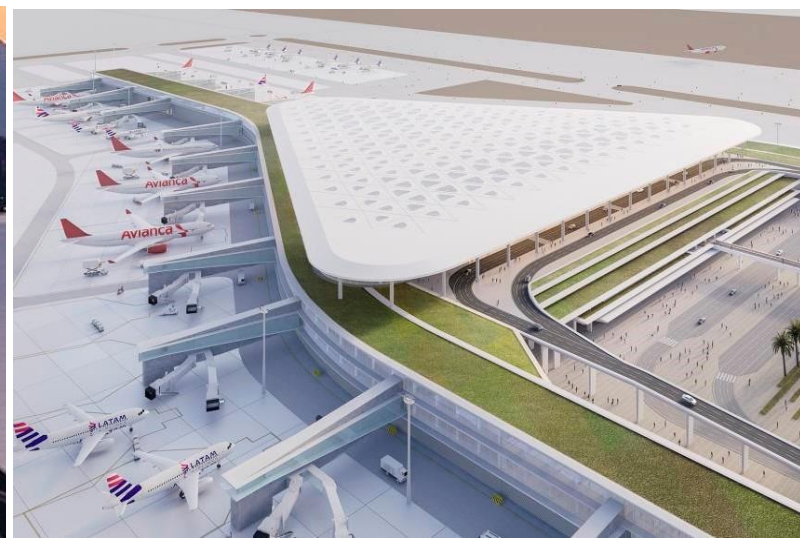
CREM - Politics, Budgeting, Risk Management



Sydney Cross-city Tunnel



SR520 Floating Bridge



Future Airport Expansion

CREM Community of Practice, December 8th, 2020 John Reilly

Previous Papers & Presentations

UCA, Fox Conference New York
January 22nd 2013



Megaprojects – Successes, Lessons Learned

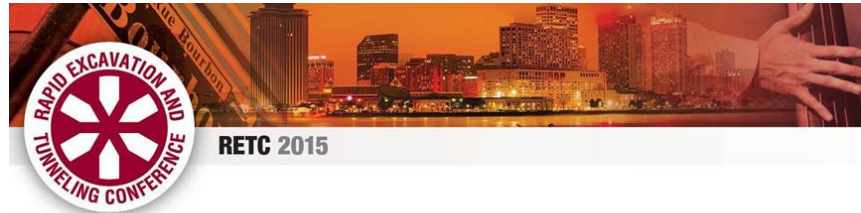
John Reilly, P.E., C.P.Eng.



ALTERNATIVE PROCUREMENT & CONTRACTING FOR MEGAPROJECTS

John Reilly, P.E., C.P.Eng.
John Reilly Associates International

Richard A. Sage, P.E., C.C.M.
Sound Transit, Director of Construction Management



Construction – You Need Risk-Based Cost Estimating

Contracting Practices Session, June 8, 2015

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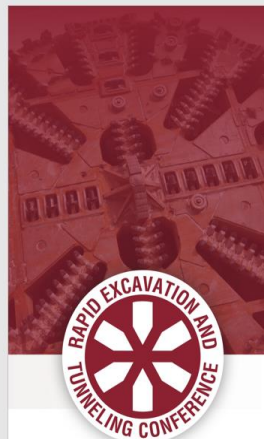


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RETc2017

Boston Central Artery/Tunnel Project – Lessons Learned

John Reilly, P.E., CPEng.
Fred Salvucci, P.E.
David J. Hatem, PC

June 6, 2017

Budget overruns, AUA Conf Seattle 2001



Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra



Debunking fake news in a post-truth era: The plausible untruths of cost underestimation in transport infrastructure projects

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ARTICLE INFO

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Fake news
Optimism bias
Strategic misrepresentation
Transport

ABSTRACT

The methodology, analysis, and the unfounded conclusions presented in the paper “Underestimating costs in public works projects: error or lie?” by Flyvbjerg, Holm, and Buhl (2002), published in the Journal of the American Planning Association are critically questioned. Flyvbjerg, Holm, and Buhl attribute the cause of cost underestimation in transport infrastructure projects to delusion (optimism bias) and deception (strategic misrepresentation). The bifurcation of the cost underestimation problem into error or lie presents a false dichotomy – an either/or choice that is invalid when juxtaposed with the real-world nature of procuring large infrastructure assets. Put simply, the conclusions presented by Flyvbjerg, Holm, and Buhl are akin to being fake news. Unfortunately, the persistent reverberation of these convenient narratives and factoids in both academia and media has led to these explanations becoming an accepted norm. In this paper, the claims made by Flyvbjerg, Holm, and Buhl are debunked. A call is made for policy-makers to embrace and utilize evidence-based research so that informed decisions about capital cost estimates and potential risks can be better ascertained at the front-end of major transport infrastructure projects.

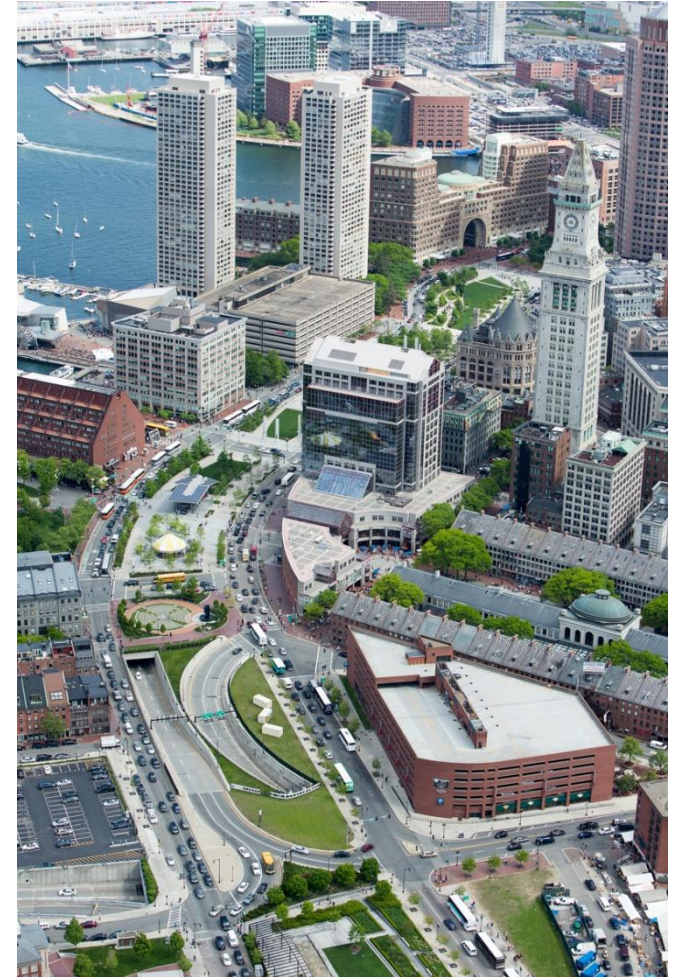
Political Environment - Goals

Need to create Public understanding and acceptance of the project

– “buy-in”, support, funding, resilience.

Requires :

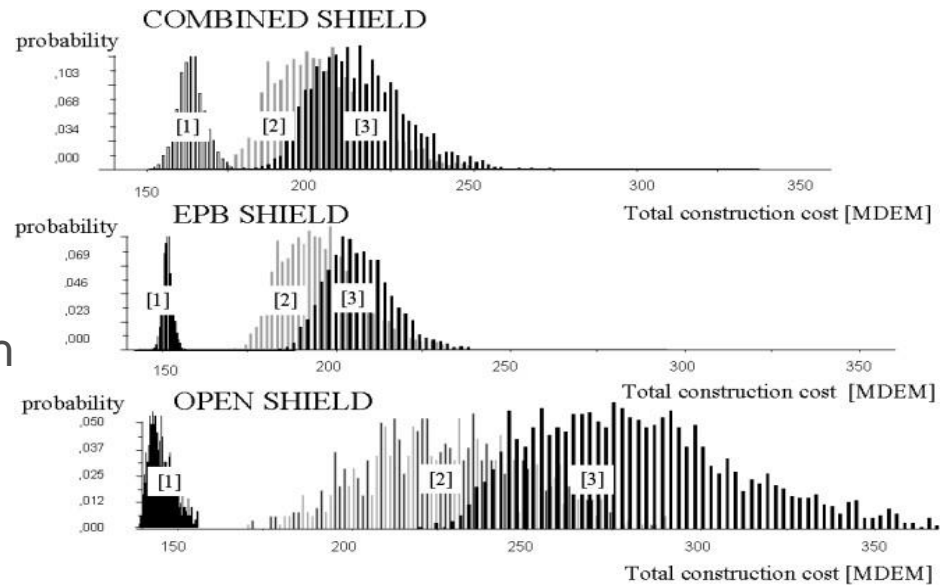
- **Political strategy** – stakeholders, key goals, public process, support
- **Ability to determine** a realistic budget and schedule (CEVP®/ PRBE)
- **Funding** – approval, availability + stability (deal with political changes)
- **Ability to meet** budget and schedule (Management Tools, Risk Processes)
- **Contracting Method** (risk management)
- **Alignment** of Agency/Engineer/Contractor
- **Communication**, media involvement



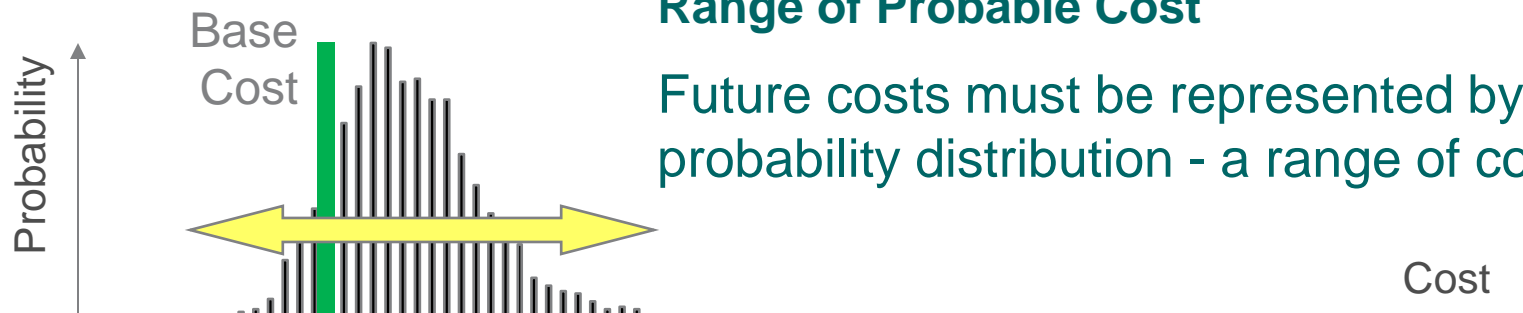
Boston Central Artery
Rose Kennedy Greenway

Evolution - “range of probable cost”

- Risk management for underground construction led to papers 1998-99 which considered risk in the context of project management practices
- Choices between basic (\$) vs. sophisticated (\$\$) tunnel boring machines led to a probabilistic approach
- Base cost + probable outcomes could be modeled to inform the choice
- Pre-cursor to WSDOT’s cost validation + probable cost of risk events (CEVP®)
- Standard graphic to communicate to politicians and public



Study of probable outturn cost for TBM selection, where [1] is base TBM cost [2] costs of probable risks [3] probable outturn cost

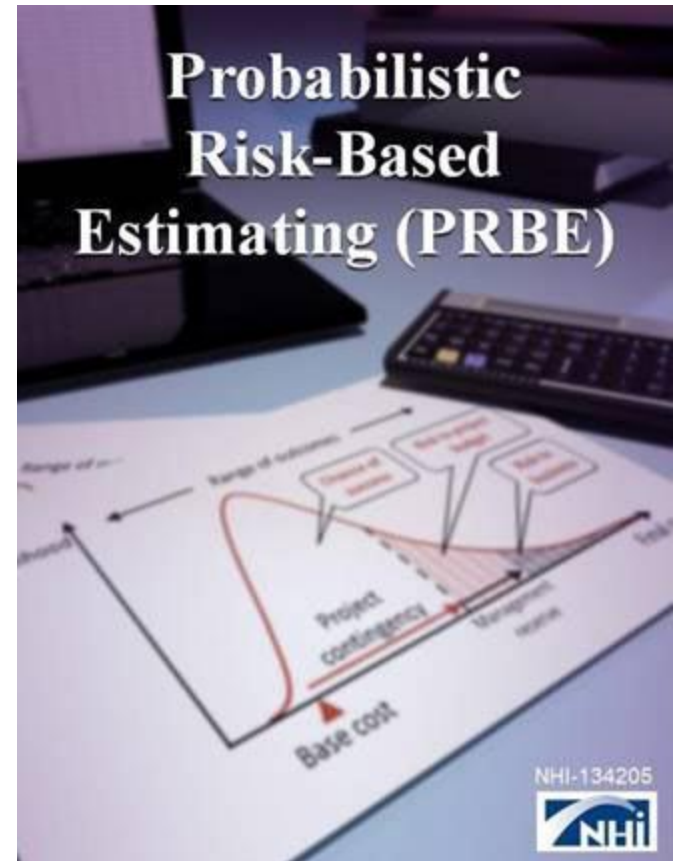
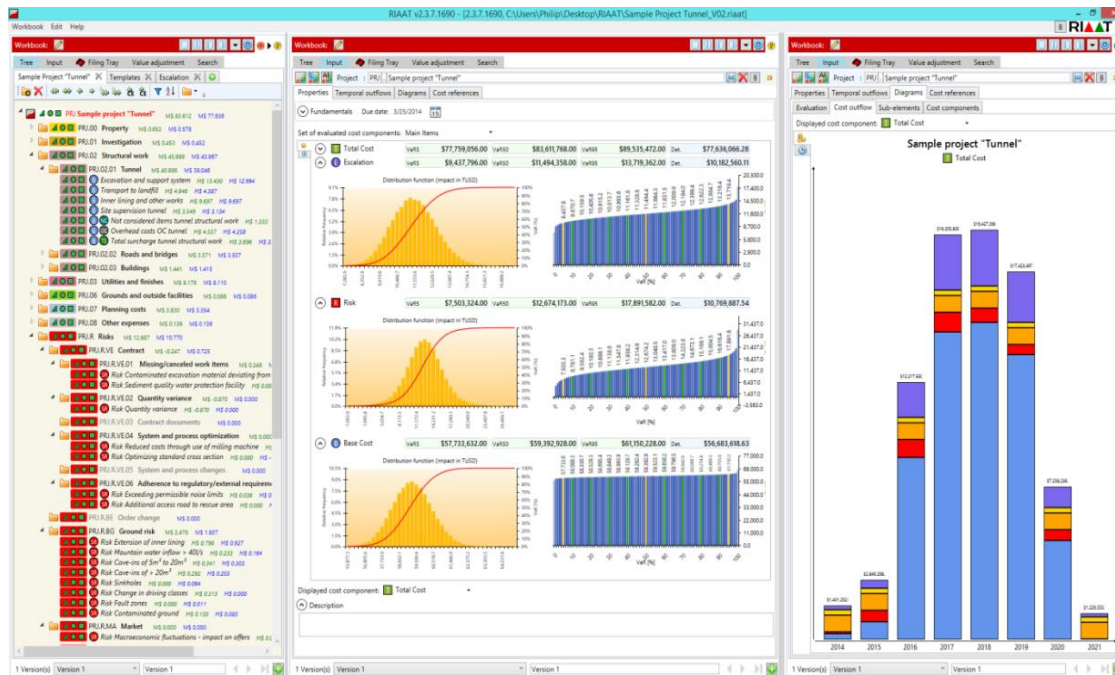


Range of Probable Cost

Future costs must be represented by a probability distribution - a range of costs

Evolution of PRBE Processes

- Since 2002, PRBE processes and systems have been developed and refined, e.g. integrated cost+schedule
- CEVP, RIAAT, PRBE Training
- Consultant developed systems



RIAAT
KNOW YOUR RISKS

Budgeting

- Historical contingency - Agency policy, experience
- Guidelines AACE etc. using Estimate Classes
- Confidence limits (Holman 2014*, NASA)
- Factors in estimate reliability
 - ☐ Level of non-familiar technology in the project.
 - ☐ Complexity of the project.
 - ☐ Quality of reference cost estimating data.
 - ☐ Quality of assumptions used in preparing the estimate.
 - ☐ Experience and skill level of the estimator.
 - ☐ Estimating techniques employed.
 - ☐ Time and level of effort budgeted to prepare the estimate.
 - ☐ The accuracy of the composition of the input and output process streams
- Ref: CEVP Basis of Estimate Analysis.

* “Improve your Contingency Estimates for More Realistic Project Budgets”

International Practices - Austria

ÖGG Guideline Cost Determination for

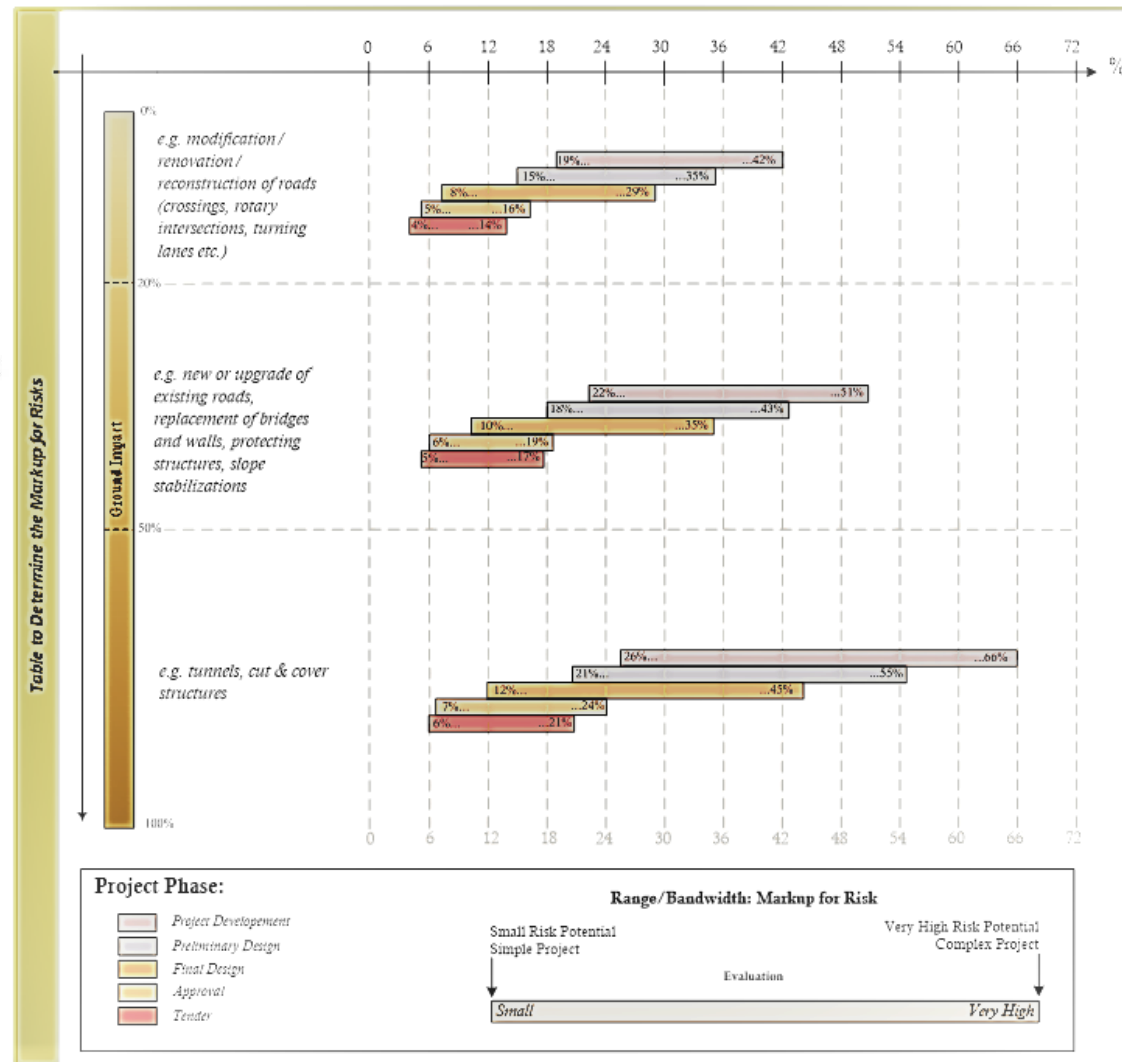
Transportation Infrastructure Projects

Taking relevant project risk and uncertainty into consideration

September 30th, 2016

1. Highways
2. Bridges
3. Tunnels

Markup for Risks, Data Sheet for Benchmark Method

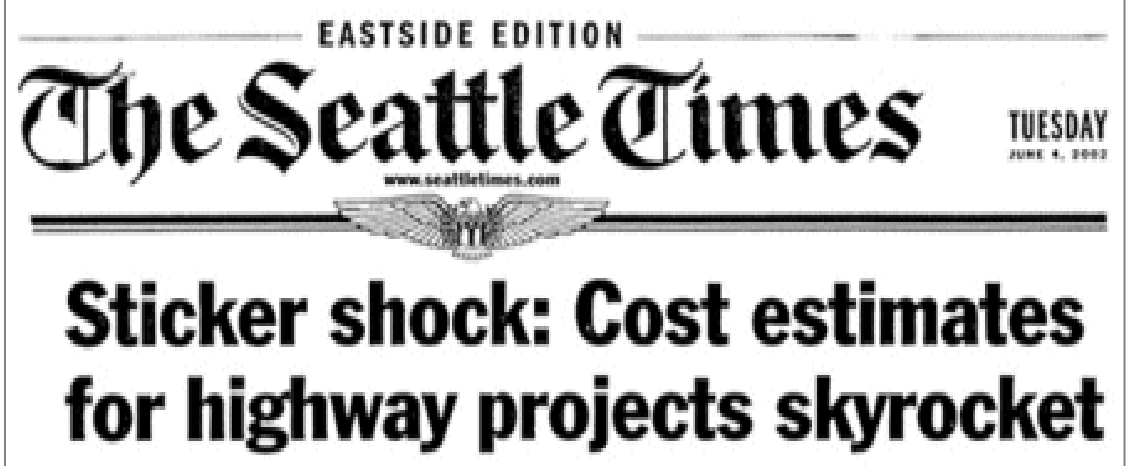


Communication Strategies, WSDOT

TUESDAY
June 4, 2002



SUNDAY
June 9, 2002



Shocking or not, the Department of Transportation has performed an unprecedented public service with these latest cost estimates. It is a much-needed dose of fiscal reality. The department offered realistic cost-range estimates.

- Seattle Post-Intelligencer Editorial

Giving citizens a range of costs, including full disclosure of the variables, "is not only politically smart, but it's common sense"

- John Reilly, quoted in the
Seattle Post-Intelligencer,
June 9 2002



"We're not going to give you a single number, it will be a range of probable cost and we won't define that until we understand the project sufficiently....."

Applications, Communication, Advances

➤ Alaskan Way Decision

- December 2009
 - Quick CEVP workshop, cost + risk analysis
80% = \$2.2 billion
 - Legislature voted \$1.96 billion (60%)



SR-99 DEEP BORE TUNNEL				
Royal Brougham to Harrison Street				
January 13 th , 2009				
Project Description: <ul style="list-style-type: none">Replaces the central portion of the existing viaduct with a four-lane, bypass single bore tunnel on 1st Avenue.Demolishes the existing viaductRestores Alaskan Way with four surface lanes and connection to Elliott and Western Tunnel Benefits: <ul style="list-style-type: none">Maintains highway capacity consistent with all scenarios investigated in 2008.Strong earthquake performance leading to reliable lifeline link after event.Opens the waterfront to improve the pedestrian promenade, new open space, bicycle trails, double track for the streetcar and better access from CityEliminates noise and visual impacts of elevated viaduct in central waterfront area.Alternative is favored by many local residents, stakeholders and local agencies.Alternative has long expected life - reduces long term life-cycle costsProvides a throughput corridor that is removed from the waterfront.Provides improved pedestrian and bicycle access along Alaskan Way.Connects the city to the waterfrontAdds benefits through improved property values along the waterfront and additional open space Project Risks: <ul style="list-style-type: none">Catastrophic failure of viaduct and/or seawall could occur before replacement.Limited number of contractors qualified and available to pursue a project this large.Schedule is aggressive and requires accelerated environmental, design, procurement and constructionTunnel Boring Machine will be a few feet larger than the largest built to date but the technology has been proven in similar ground conditionsGeotechnical data is based on a general knowledge of soils from other projectsPotential legal and environmental challenges	Schedule: <p>EIS / Early actions 2009-2010 Begin Construction Fall 2010 Open to traffic Fall 2015 Completion (follow-on actions) 2016</p>	CEVP-Type Cost Range: 		
	Most Probable Cost 20% chance the cost is less than \$1.2 billion 60% chance the cost is less than \$1.9 billion 80% chance the cost is less than \$2.2 billion		(Range)	
	Key Assumptions: <ul style="list-style-type: none">Tunnel realigned under 1st AvenueCross section is a stacked 2 over 2 configuration in a single 54' diameter tunnelSchedule is based on accelerated environmental, design, TBM procurement, pre-construction and permitting.Requires an advanced (incentivised) design/build contract to reduce total time for design, procurement of the TBM and constructionCost does not include a direct connection to Elliott and Western			
	Financial Fine Print: <ul style="list-style-type: none">Cost is escalated to the midpoint of construction using Global Insight's recommendation per WSDOT policy.\$2.4 Billion is currently secured for the AWW & Seawall Project.Approximately \$1.5 billion remains for the tunnelAdditional local money must be secured to complete the tunnel.The Port of Seattle and City of Seattle have proposals in process to add to the available project funding in order to complete the project.			
Level of Project Design:	Low	Medium	High	
January 13, 2009				

Applications, Communication, Advances

- **Alaskan Way – how to shape project to the authorized cost/budget?**
- **Used CEVP, Value Engineering + Scope**
 - Initial CEVP workshop - recommended 80% CEVP of \$2.2b
 - Legislature authorized ~ 60% \$1.9b
 - Intensive CEVP+VE workshops to modify project to meet 60% probable \$1.96b
 - Final outturn cost? - more like 80%+ number after major TBM risks eventuate (reference CEVP risk register)

Setting Budgets

- Normal routine projects – historical, rich data sets
 - High confidence in setting budget, low contingency (e.g. 7% + management reserve for small highway projects)
- Underground, routine ~ 30% + management reserve
- Complex / mega-projects (\$billions):
 - Use validation + probabilistic cost/risk analysis
 - Should consider budget at 80% probability
 - WSDOT Policy in 2003 was 80%
 - WSDOT Policy in 2010 was 60%
 - Dynamics of multiple probable projects acknowledged
- Complex tunnel project Michigan
 - Owner asked “Why can’t we use 50% for the budget?”
 - Yes, if your funding/contingency strategy is aligned to that.....
 - 1st question asked by the WSDOT Commission 2002.

Setting Budgets

- **International airport expansion: new runway, new terminal, FLS**
 - **Initially:**
 - Budget set by Board of Directors
 - Cost validation + CEVP shows very low chance to meet budget
 - Functional requirements drive design, little cost saving possible
 - Project moves ahead, (COVID further impacts cost & schedule)
 - **Now**
 - Funding restrictions drive redesign of program – use of existing terminal, reduced size of new terminal, expansion capability.



Take-aways

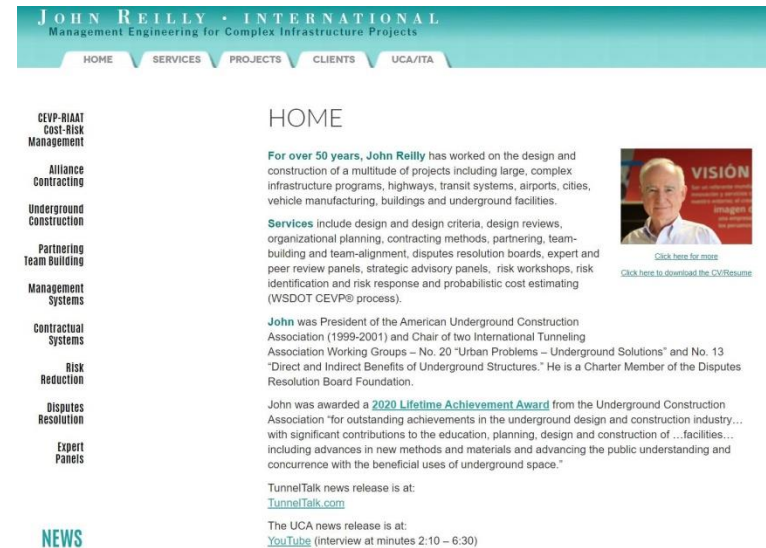
- 20 years later, everything that was being said in 2001/2002 is still applicable – perhaps even more so... the core fundamentals are still valid and still apply.
- Experience with CEVP et. al. continues - we refine techniques, fundamental aspects are sound.
- It is important that we educate others ... public, politicians, executive leadership etc.
- These processes produce information for decision-makers to decide, based on their appetite for risk, their understanding of the information and its limits.
- A CEVP report is not a decision-document, it is an information document – for those decision makers.

Further Information

➤ Thanks for your participation, more information is available at: www.JohnReilly.us

➤ Latest paper (Nov 2020):
https://www.johnreilly.us/publicationspdfs/Reilly_2020_TBM_procurement_risk_and_technology_advancement.pdf

➤ Today's Discussion Follows, moderated by Mark



Discussion

- **What does it take to have a good and sufficient process to establish a realistic budget?**
 - An aligned management-project team?
 - Established procedures and policies?
 - Supportive political environment?
 - Good cost estimating & validation capability?
 - Understanding bias?

- Your input and questions.....